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Title: CHAMFERING METHOD FOR GLASS DISC ;

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Applicant(s): NIPPON SHEET GLASS CO LTD ;

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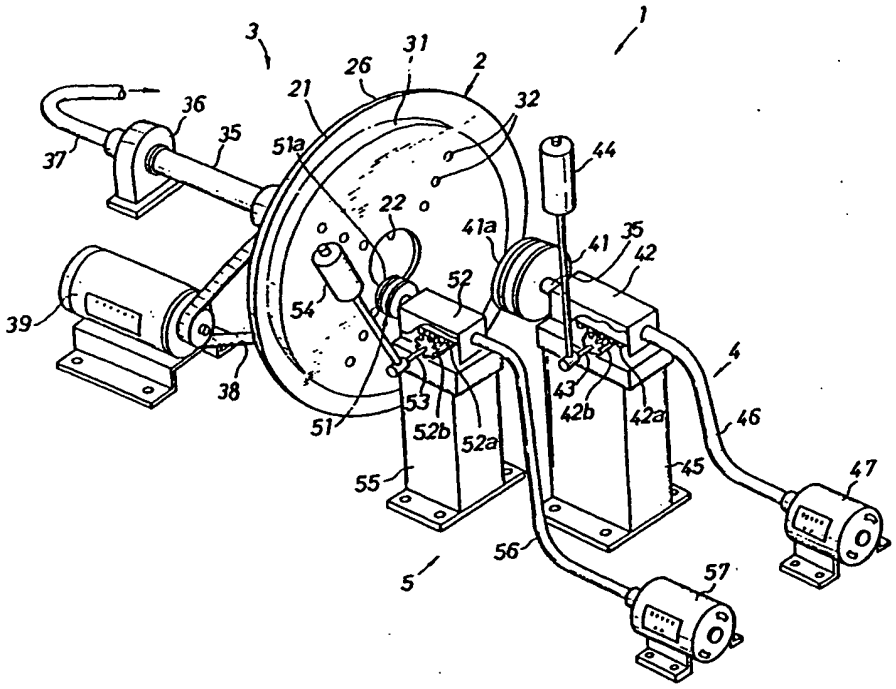
Equivalents:

ABSTRACT:

PURPOSE:To improve productivity by turning a glass disc approximately about a center axis, supporting a rotary grinding face having a rotation axis in the same plane as center axis in such a way as to advance and retreat freely and pressing rotary grinding stones for contact with the internal and external edge corners of the glass disc in an aslant direction under a rotating state.

CONSTITUTION:A glass disc 2 is turned and grinding stones 51a and 41a for the internal and external surfaces thereof are made in contact with both surfaces of the glass disc 2 under the predetermined force, thereby chamfering internal and external edge corners 22 and 25 on the surface 23 of the glass disc 2. As a result, the entire surface of the grinding stones 41a and 51a can be used for chamfering and it is possible to extend the lifetime thereof and unify a chamfered shape. Also, the grinding stones 41a and 51a can be made to advance and retreat elastically via cushion materials 41c and 51c fitted in the direction of the rotary axes 41e and 51e of the grinding stones 41a and 51a. A deviation in radial and thickness directions, therefore, can be absorbed when the glass disc 2 turns eccentrically, thereby preventing the occurrence of a micro-crack and a fracture.

第 1 図



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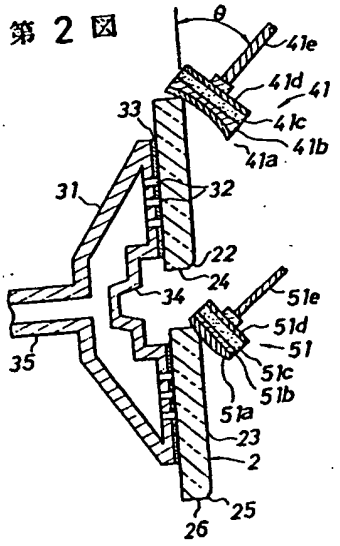

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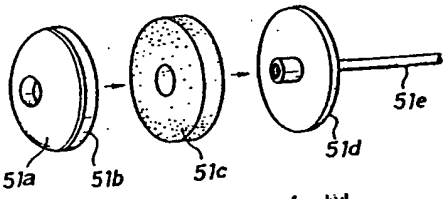

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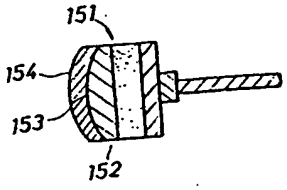

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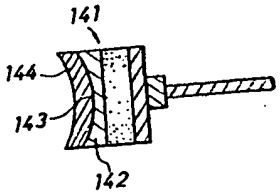

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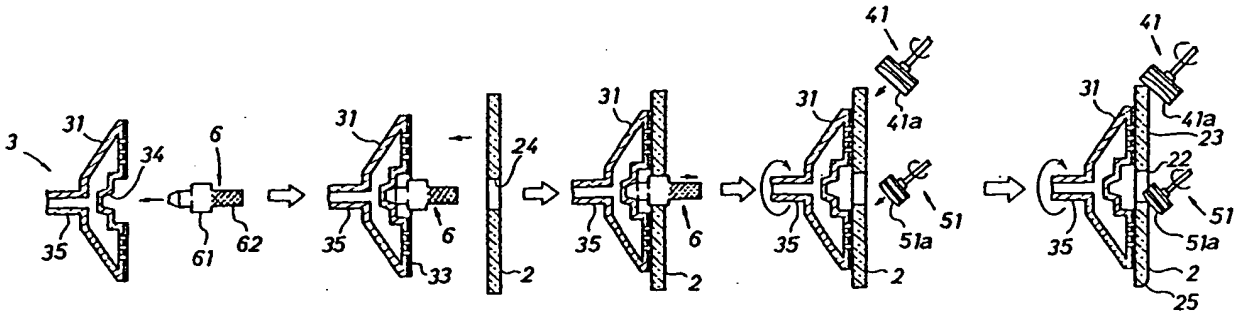
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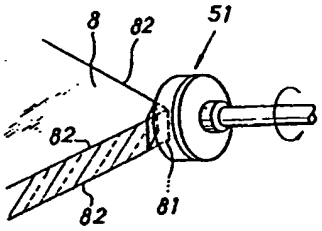
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Japanese Kokai Patent Application No.
Sho 64[1989]-5759

METHOD FOR CHAMFERING A GLASS DISC

Toshimasa Kuramoto and Kazuto Kase

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METHOD FOR CHAMFERING A GLASS DISC

[Garasu enban mentori hoho]

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[There are no amendments to this patent.]

Claims

1. A method for chamfering a glass disc characterized in that during the chamfering of the outer rim or the inner rim of a glass disc used as an optical disc, the aforementioned glass disc is rotated roughly around the center axis, and a rotary grinding wheel which is provided with a rotary shaft within the same plane as that of said center axis and supported in such a manner that it can be advanced and retracted elastically is brought into contact with the part of the aforementioned glass disc to be chamfered from a slanting direction while it is rotated.

2. The method for chamfering a glass disc described under Claim 1 characterized in that the aforementioned grinding wheel is supported via a buffering material, such as a sponge, while it is allowed to be advanced and retracted elastically.

Detailed explanation of the invention

Industrial application field

The present invention pertains to a method for chamfering the outer rim or the inner rim of a glass disc used as an optical disc.

Prior art

In the past, to chamfer the outer rim or the inner rim of a disc-shaped glass plate, the glass plate was rotated using a spinning device, and a grinding wheel was held by hand and pressed against the part of the glass plate to be chamfered to grind it; or the chamfering was achieved by pressing against it with a device equipped with a rigidly mounted grinding wheel.

Problem to be solved by the invention

However, in the case of the aforementioned method in which the grinding wheel was held by hand, the grinding wheel was difficult to hold steady while applying pressure, resulting in uneven chamfering margins and poor productivity. In addition, during the machining using the aforementioned device, because the grinding wheel was mounted rigidly, uneven force was applied from glass disc to the grinding wheel when the glass disc was rotated eccentrically with respect to the rotary shaft, resulting in problems of microcracks and chippings at the chamfered part of the glass disc.

Accordingly, the purpose of the present invention is to present a glass disc chamfering method by which chamfering can be realized with a uniform chamfering margin so as to achieve a high productivity during the chamfering of the outer rim or the inner rim of a glass disc, and no chipping is created even when the glass disc is rotated somewhat eccentrically.

Means to solve the problem

In order to achieve the aforementioned objective, the present invention is characterized in that a glass disc is rotated roughly around the center axis, a rotary grinding wheel which is provided with a rotary shaft within the same plane as that of said center axis is supported in such a manner that it can be advanced and retracted elastically, and said rotary grinding wheel is brought into contact with the outer rim part or the inner rim part of the aforementioned glass disc from a slanting direction while it is rotated.

Operation

Because the rotary grinding wheel can be brought into contact with the glass disc in such a manner that it can be advanced and retracted elastically from a slanting direction, deviations of the glass disc in the radius direction and the direction of the thickness of the plate created by eccentricity can be absorbed elastically. Thus, no excessive force is applied to the part to be chamfered, and no microcracks are created as a result.

Application example

An ideal application example of the present invention will be explained below based on the figures.

Figure 1 is an oblique view of the cardinal part of a chamfering device pertaining to the present invention. Chamfering device 1 is configured with vacuum chuck mechanism 3 for holding glass disc 2 while allowing it to rotate freely, outer rim chamfering mechanism 4 which is brought into contact with outer rim 21 of glass disc 2 held on said vacuum chuck mechanism 3 to chamfer it, and inner rim chamfering mechanism 5 which is brought into contact with inner rim 22 of aforementioned glass disc 2 to chamfer it.

Aforementioned glass disc 2 is an optical disc substrate for recording pieces of information such as songs, images, and documents in such a manner that they can be read optically. It is round with concentric inner and outer rims, and it is roughly 1 mm thick. As it is shown in Figure 2 also, vacuum chuck mechanism 3 for mounting glass disc 2 machined in said manner is equipped with chuck part 31 where glass disc 2 is attached via suction openings 32, rotary shaft 35 which is fixed to said chuck part 31 and supported by bearing 36, and suction pipe 37 which is linked to suction openings 32 and connected to a vacuum pump not illustrated. Aforementioned rotary shaft 35 is configured such that it can be rotated via belt 38 and spinning motor 39. Furthermore, as shown in Figure 2, Teflon sheet 33 for preventing glass disc 2 from being damaged is provided on the surface of chuck part 31. As shown in Figure 6, concave part 34 where centering jig 6 is inserted for attaching glass disc 2 concentrically is provided at the center part of the surface of chuck part 31 of aforementioned vacuum chuck mechanism 3.

Outer rim chamfering mechanism 4 for chamfering outer rim 21 of aforementioned glass disc 2 is equipped with head part 41 with grinding wheel 41a furnished with diamond stone at the tip retaining member 42 for retaining said head part 41 on supporting bench 45, and rack gear 42a is provided below said retaining member 42. Pinion gear 42b is engaged in aforementioned rack gear 42a, and pressure weight 44 for pressing head part 41 against glass disc 2 with a prescribed pressure is linked to shaft 43 of said pinion gear 42b. Aforementioned head part 41 is linked to grinding wheel spinning motor 47 via flexible wire 46 and rotated by said grinding wheel spinning motor 47.

Aforementioned flexible wire 46 comprises an outer wire and an inner wire, both of which can be bent as desired, and the inner wire is configured such that it can be rotated inside of the outer wire. In addition, inner rim chamfering mechanism 5 for chamfering inner rim 22 of glass disc 2 has the same configuration as that of outer rim chamfering mechanism 4; wherein, 51 is a head part; 51a is a grinding wheel; 52 is a retaining member; 52a is a crack gear; 52b is a pinion gear; 54 is a pressure weight; 55 is a supporting bench; 56 is a flexible wire; and 57 is a grinding wheel spinning motor.

Figure 3 is an oblique view of the head part of the inner rim chamfering mechanism when it is disassembled. Head part 51 is comprises grinding wheel 41a [sic, 51a] provided at the front end which is brought into contact with inner rim 22 of glass disc 2, disc-shaped mount 41b for fixing said grinding wheel 41a, base part 41d for fixing said mount 41b via buffering material 41c, such as sponge, and rotary shaft 41e linked to said base part 41d; and the bottom end of rotary shaft 41e is linked to flexible wire 46. Rotary shaft 35 is mounted onto supporting bench 45 in such a manner that head part 41 configured in said manner creates a prescribed angle θ corresponding to the chamfering angle with respect to surface 23 of glass disc 2 as shown in Figure 2.

Figure 4 shows another application example of the head part for the inner rim; wherein, front end of mount 152 of said head part 151 is formed into the shape of a convex shape 153, and grinding wheel 154 is fixed along said convex shape 153. When grinding wheel 154 and mount 152 are formed in said manner, the grinding wheel is worn evenly, so that the service span of grinding wheel 154 can be effectively prolonged. In addition, as shown in Figure 5, when mount 142 of head part 141 for the outer rim is formed into the shape of a concave shape 153, and grinding wheel 144 is fixed along said concave shape 153, its service span can be prolonged just like head part 151 for the inner rim.

A method for chamfering glass disc 2 using the chamfering device configured in said manner will be explained reference to Figure 6.

First, centering jig 6 is inserted into insertion concave part 34 created on chuck part 31 of vacuum chuck mechanism 3 by its knurl part 62. Next, inner rim 24 of glass disc 2 is snapped onto wider part 61 of centering jig 6, and said glass disc 2 is brought into contact with Teflon sheet 33 provided on the surface of chuck part 31. At this time, glass disc 2 is sucked by a vacuum pump not illustrated in order to attach it tightly to Teflon sheet 33 provided on the surface of chuck part 31.

Rotary shaft 35 of chuck part 31 is aligned with the center of glass disc 2 in said manner, and centering jig 6 is then pulled out. Next, chuck part 31 and glass disc 2 are rotated using spinning motor 39 and belt 38, and inner rim head part 51 and outer rim head part 41 are rotated using spinning motors 57 and 47 and flexible wires 56 and 46. Next, as shown [by the diagram

given] on the rightmost side in Figure 6, grinding wheels 51a and 41a for the inner rim and the outer rim are brought into contact with the surface of glass disc 2 from a slanting direction while applying prescribed amounts of pressure using pressure weights 54 and 44 in order to chamfer inner rim 22 and outer rim 25 on surface side 23 of glass disc 2. At this time, because glass disc 2 and inner and outer rim grinding wheels 41a and 51a are brought into contact from a slanting direction while they are all rotated, the entire surfaces of grinding wheels 41a and 51a can be used for the chamfering. Accordingly, grinding wheels 41a and 51a are free from partial wearing, so that the service span of grinding wheels 41a and 51a can be prolonged, and uniform chamfering can be realized. In addition, because buffering materials 41c and 51c are laid in the directions of rotary shafts 41e and 51e of grinding wheels 41a and 51a in order to allow them to be advanced and retracted elastically, any deviation in the radius direction and any deviation in the thickness direction of the plate, such as a warpage, during the chucking can be absorbed as buffering materials 41c and 51c contract and expand, for example, in the event where glass disc 2 is rotated eccentrically with respect to rotary shaft 35 of chuck part 31 due to eccentricity of inner rim 24 and outer rim 26 of glass disc 2, for example, so that no microcrack or chipping is created at the chamfered surfaces of glass disc 2 as a fragile material.

Furthermore, head parts 41 and 51 of the aforementioned chamfering device can be used also for chamfering corner parts 8 of rectangular glass plate 81 as well as for chamfering straight edges 82.

Effects of the invention

As is clear from the explanation given above, because the rotating grinding wheels are brought into contact with the glass disc from a slanting direction in such a manner that they can be advanced and retracted elastically, deviations in the radius direction and the thickness direction when the glass disc is rotated can be absorbed, and no microcrack or chipping is created at the chamfered surfaces. Therefore, the present invention offers advantages in that chamfering can be achieved with a uniform chamfering margin, high productivity can be attained, and the chamfering can be realized even when the glass disc is attached somewhat eccentrically.

Brief description of the figures

Figure 1 is an oblique view of the cardinal part of a chamfering device pertaining to an application example of the present invention. Figure 2 is a cross-sectional view of the chamfering condition. Figure 3 is an oblique view of the head part when it is disassembled. Figure 4 is a side view of the head part equipped with a grinding wheel for the inner rim in Figure 4. Figure 5 is a side view of the head part equipped with a grinding wheel for the outer rim. Figure 6 are

diagrams illustrating the chamfering method. Figure 7 is an oblique view showing how a rectangular glass plate is chamfered.

Furthermore, in the figures, 2 represents a glass disc; 22 and 25 represent a chamfering part; 24 represents the inner rim; 26 represents the outer rim; and 41a and 51a represent rotary grinding wheels.

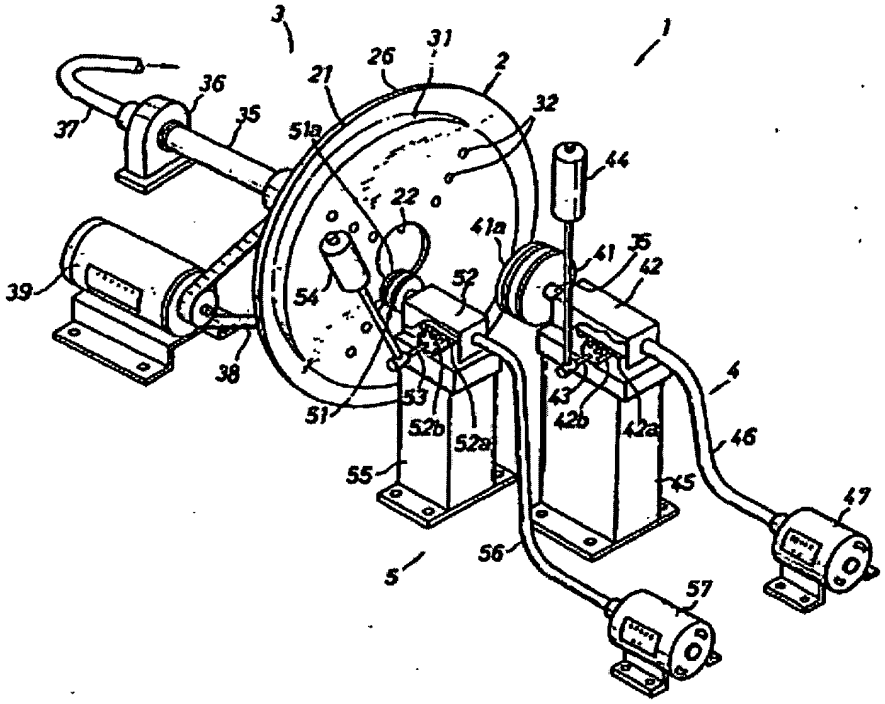

Figure 1

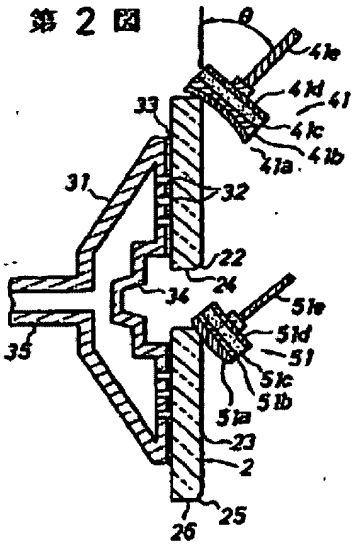

Figure 2

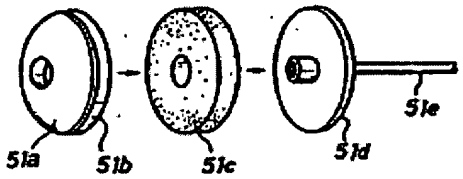

Figure 3

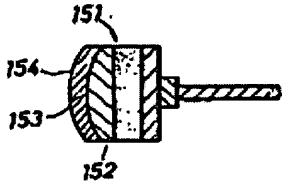

Figure 4

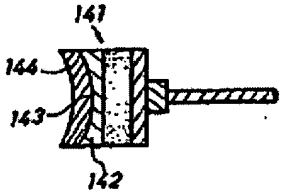

Figure 5

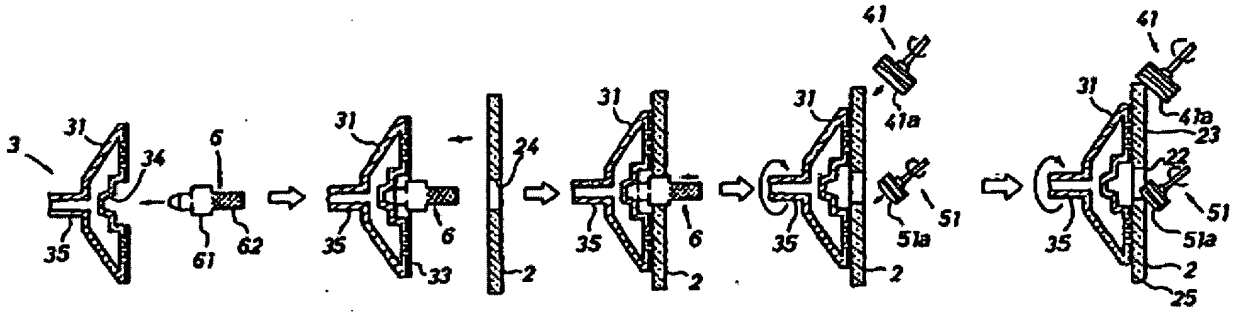

Figure 6

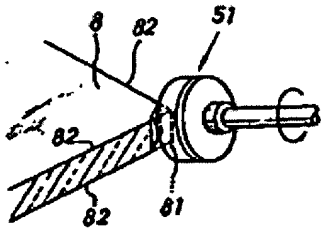

Figure 7